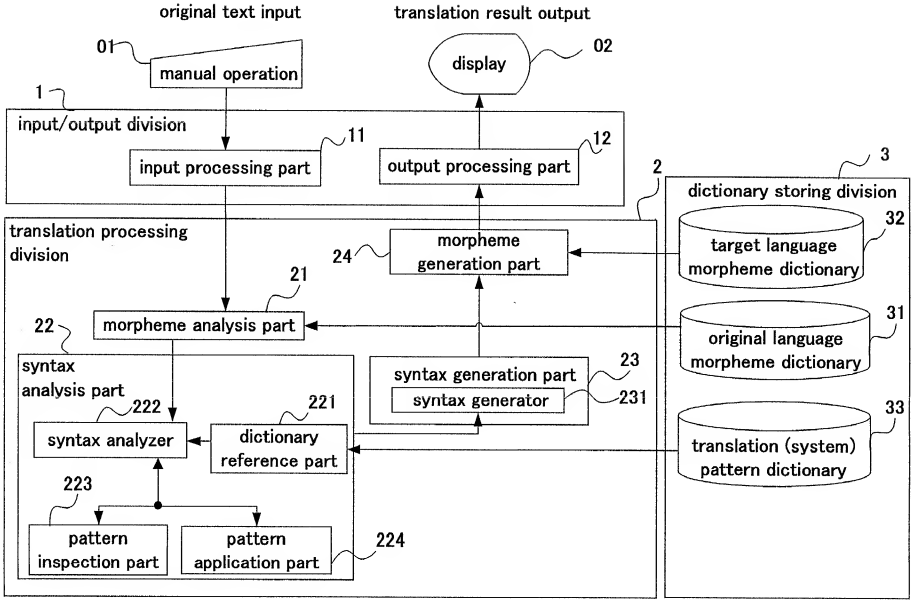
FIG.1



Inventors: MURATA et al
Atty. Dkt: 31750-173994
Filed: July 23, 2001

FIG.2

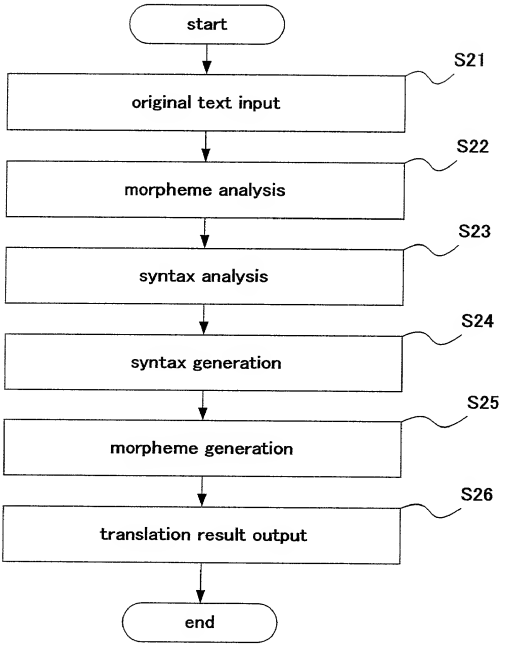


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FIG.3

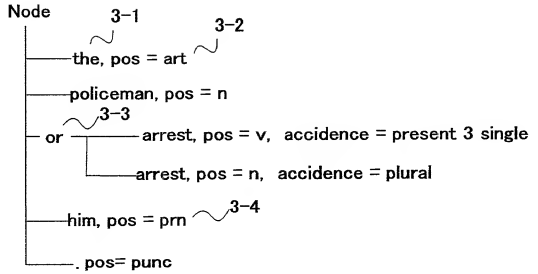

Node
3-1
3-2
the, pos = art
policeman, pos = n
3-3
or
arrest, pos = v, accidence = present 3 single
arrest, pos = n, accidence = plural
him, pos = prn
3-4
. pos= punc

FIG.4

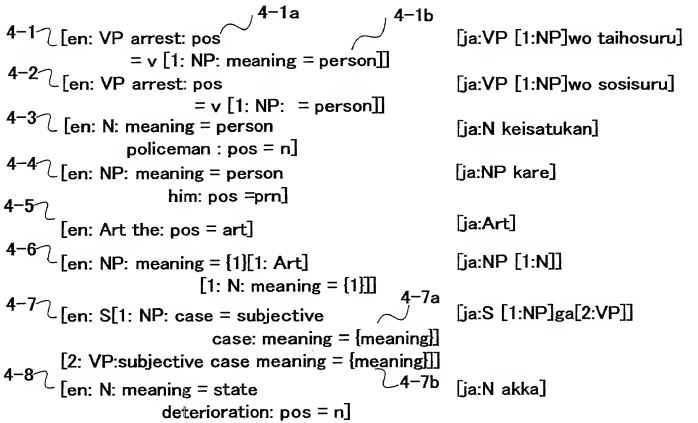

4-1
4-1a
4-1b
[en: VP arrest: pos
= v [1: NP: meaning = person]]
[ja:VP [1:NP]wo taihosuru]
4-2
[en: VP arrest: pos
= v [1: NP: = person]]
[ja:VP [1:NP]wo sosisuru]
4-3
[en: N: meaning = person
policeman : pos = n]
[ja:N keisatukan]
4-4
[en: NP: meaning = person
him: pos =prn]
[ja:NP kare]
4-5
[en: Art the: pos = art]
[ja:Art]
4-6
[en: NP: meaning = [1][1: Art]
[1: N: meaning = [1]]]
[ja:NP [1:N]]
4-7
4-7a
[en: S[1: NP: case = subjective
case: meaning = [meaning]]
[2: VP:subjective case meaning = [meaning]]]
[ja:S [1:NP]ga[2:VP]]
4-8
4-7b
[en: N: meaning = state
deterioration: pos = n]
[ja:N akka]

FIG.5

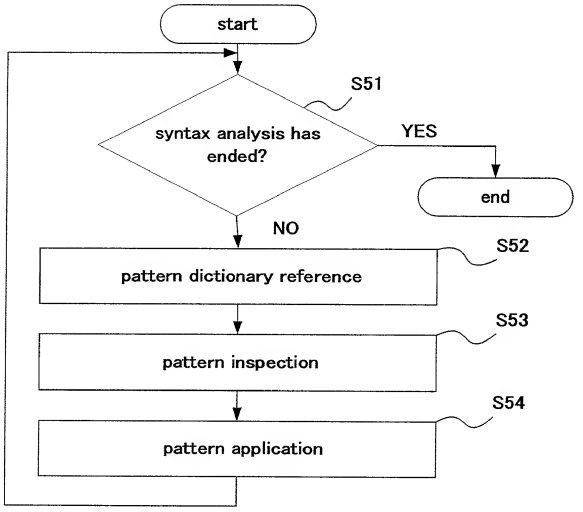


FIG.6

(a) VP
- arrest; pos = v
- NP: meaning = person

(b) VP
- arrest; pos = v
- NP: meaning = person

(C) [en: NP him: pos =prn: meaning = person]

FIG.7

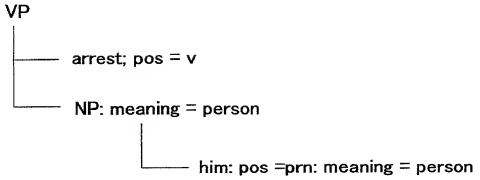


FIG.8

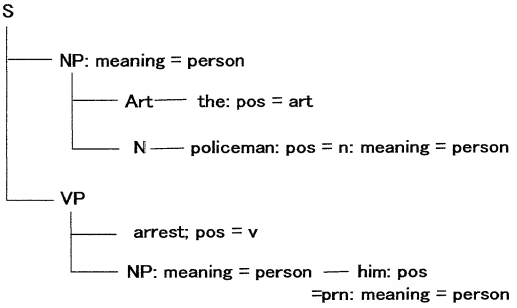


FIG.9

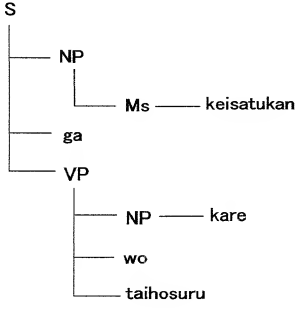
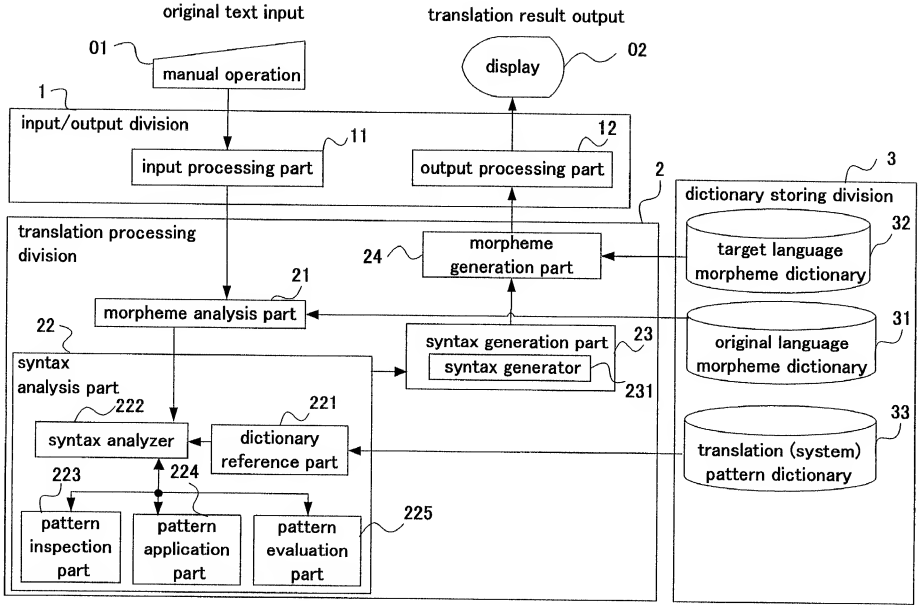


FIG.10



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Atty. Dkt: 31759-17394
Filed: July 23, 2001

FIG.11

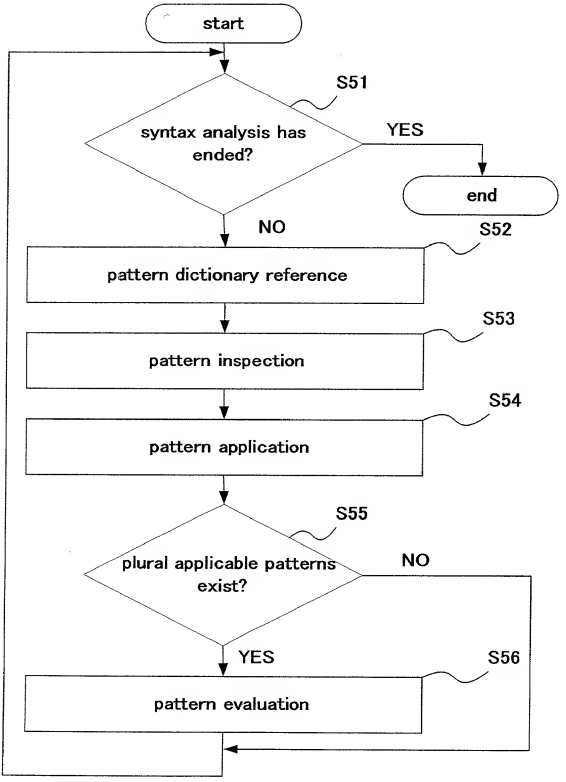
start
S51
syntax analysis has ended?
YES
end
NO
S52
pattern dictionary reference
S53
pattern inspection
S54
pattern application
S55
plural applicable patterns exist?
NO
YES
S56
pattern evaluation

FIG.12

12-1	[en: VP arrest: pos = v [1: NP: meaning = person]]	[ja:VP [1:NP wo taihosuru]
12-2	[en: VP arrest: pos = v [1: NP:meaning! = person]]	[ja:VP [1:NP] wo sosisuru]
12-3	[en: VP: arrest: pos = v a attention]	[ja:VP kyoumi wo hiku]
12-4	[en: NP: meaning = thing it: pos =prn]	[ja:NP it]
12-5	[en: Art the: pos = art]	[ja:Art]
12-6	[en: N: meaning = st ate deterioration: pos = n]	[ja:Ms akka]
12-7	[en: N present pos = n]	[ja:Ms genzai]
12-8	[en: A present pos = adj]	[ja:Ks genzai no]
12-9	![en: NP: meaning = {1}[1: Art][2: A] [3: N: meaning = {1}]]	[ja:NP [2:A][3:N]]
12-10	[en: NP: meaning = {1}[1: Art][2: N] [3: N: meaning = {1}]]	[ja:NP [2:A][3:N]]
12-11	[en: S[1: NP: meaning = {meaning}] [2: VP: subjective meaning = {meaning}]]	[ja:S [1:NP]ga[2:VP]]
12-12	*[en: S[1: NP][2: VP]]	[ja:S [1:NP]ga[2:VP]]

FIG.13

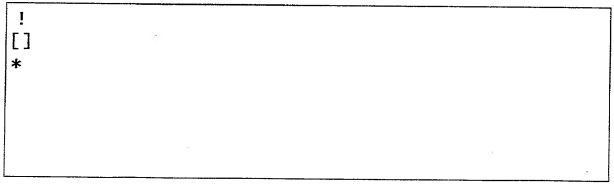

FIG.14

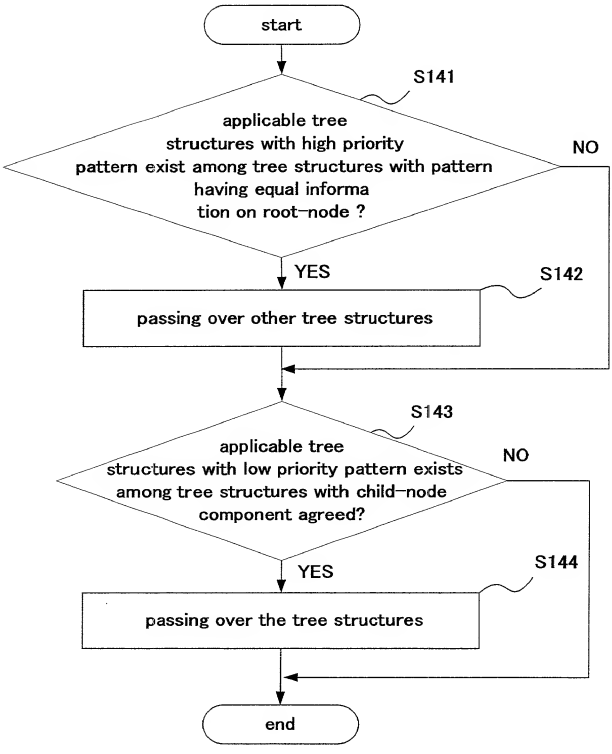

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FIG.15

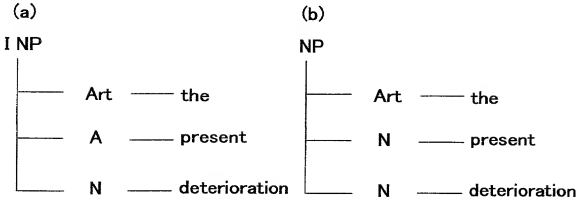

FIG.16

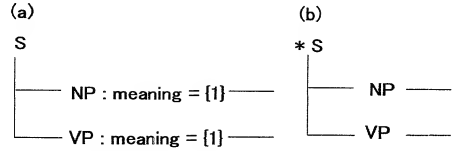

FIG.17

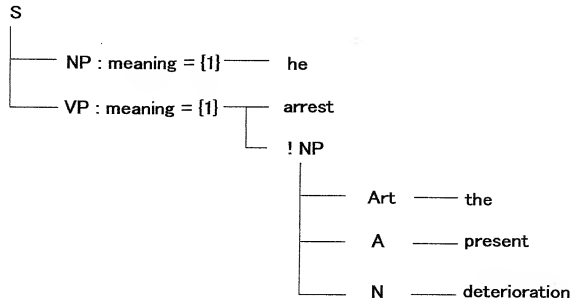

FIG.18

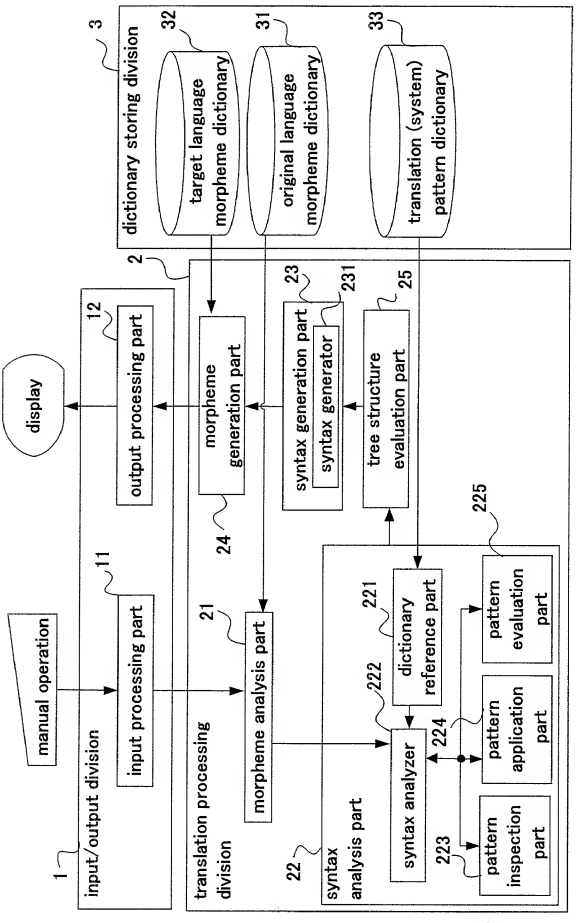
1
input/output division
manual operation
input processing part
11
display
output processing part
12
2
translation processing division
morpheme analysis part
21
morpheme generation part
24
syntax generation part
23
syntax generator
231
tree structure evaluation part
25
22
syntax analysis part
syntax analyzer
223
dictionary reference part
221
222
pattern application part
224
pattern evaluation part
225
pattern inspection part
3
dictionary storing division
target language morpheme dictionary
32
original language morpheme dictionary
31
translation (system) pattern dictionary
33

FIG.19

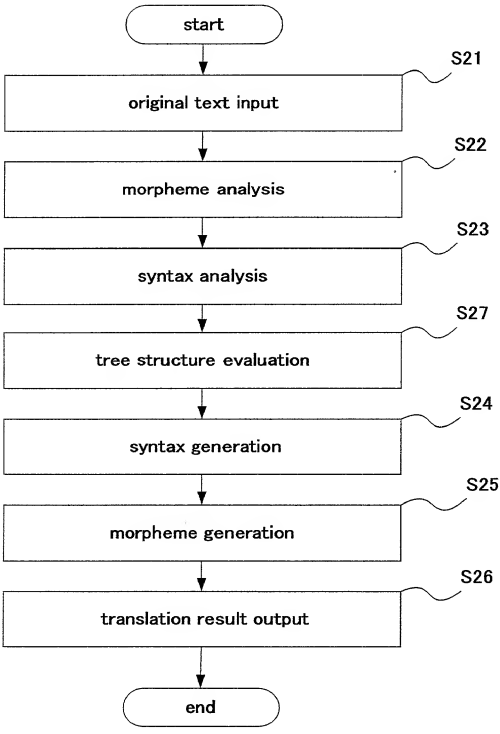

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FIG.20

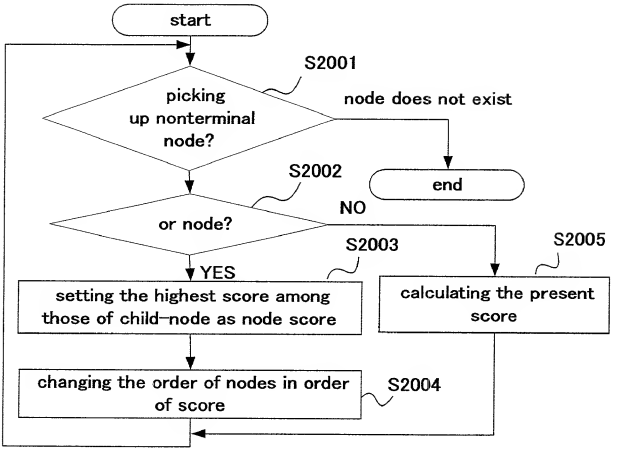
start
S2001
picking up nonterminal node?
node does not exist
end
S2002
or node?
NO
YES
S2003
S2005
setting the highest score among those of child-node as node score
calculating the present score
changing the order of nodes in order of score
S2004

FIG.21

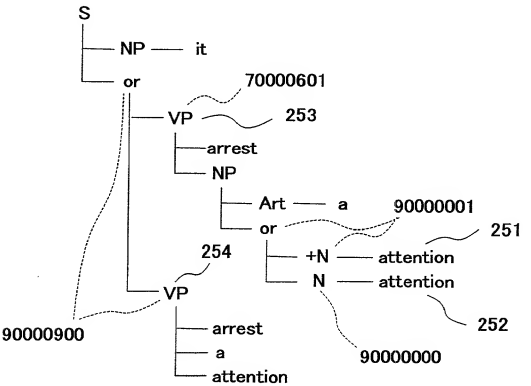
S
NP
it
or
70000601
VP
253
arrest
NP
Art
a
90000001
or
251
+N
attention
254
N
attention
VP
252
90000900
arrest
a
attention
90000000

FIG.22

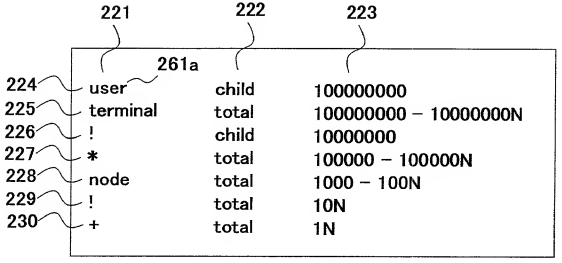
221
222
223
261a
224 user child 100000000
225 terminal total 100000000 – 10000000N
226 ! child 10000000
227 * total 100000 – 100000N
228 node total 1000 – 100N
229 ! total 10N
230 + total 1N

FIG.23

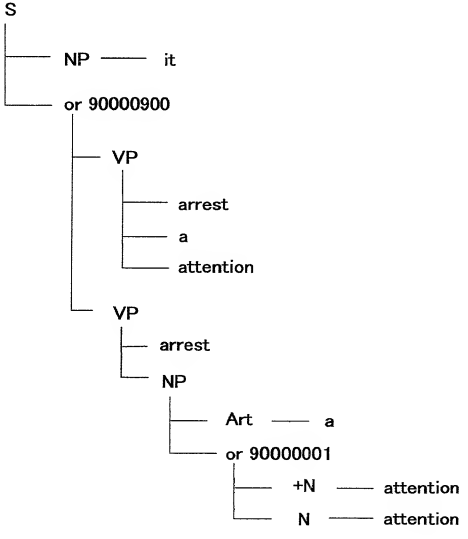
S
NP — it
or 90000900
VP
arrest
a
attention
VP
arrest
NP
Art — a
or 90000001
+N — attention
N — attention

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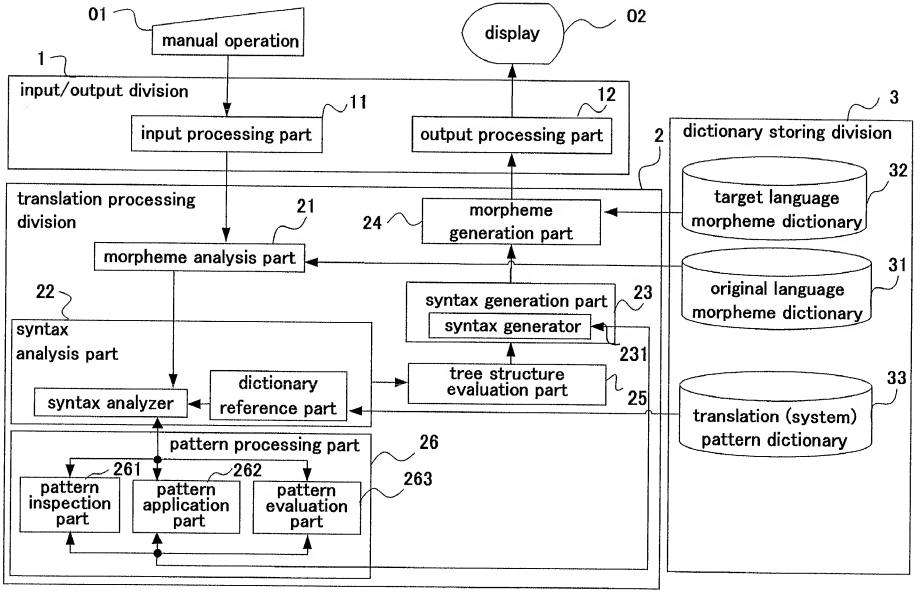
FIG.24



Inventors: MURATA, et al
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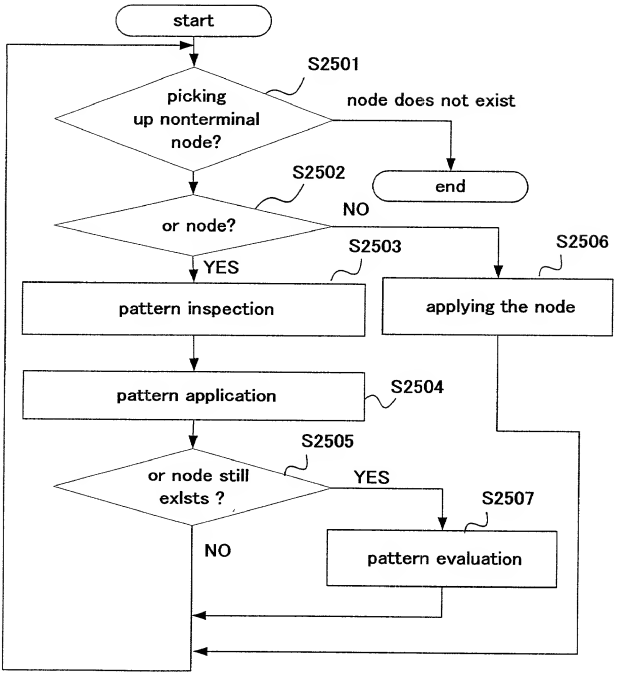
Filed: July 23, 2001

FIG.25



TDE2201 T0660660

FIG.26

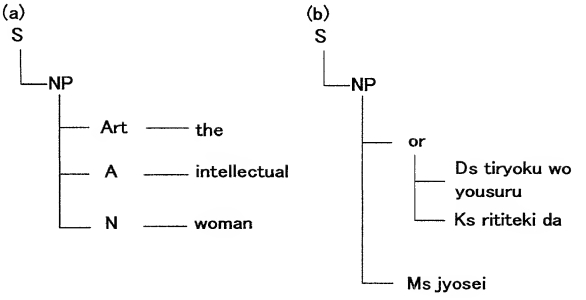


FIG.27

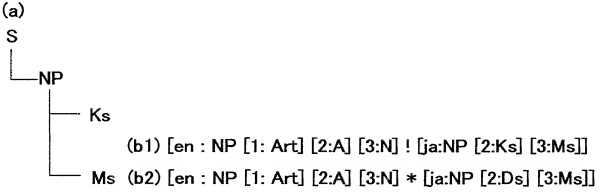


FIG.28

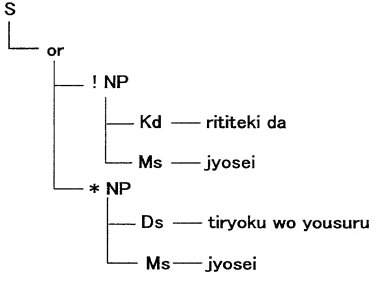


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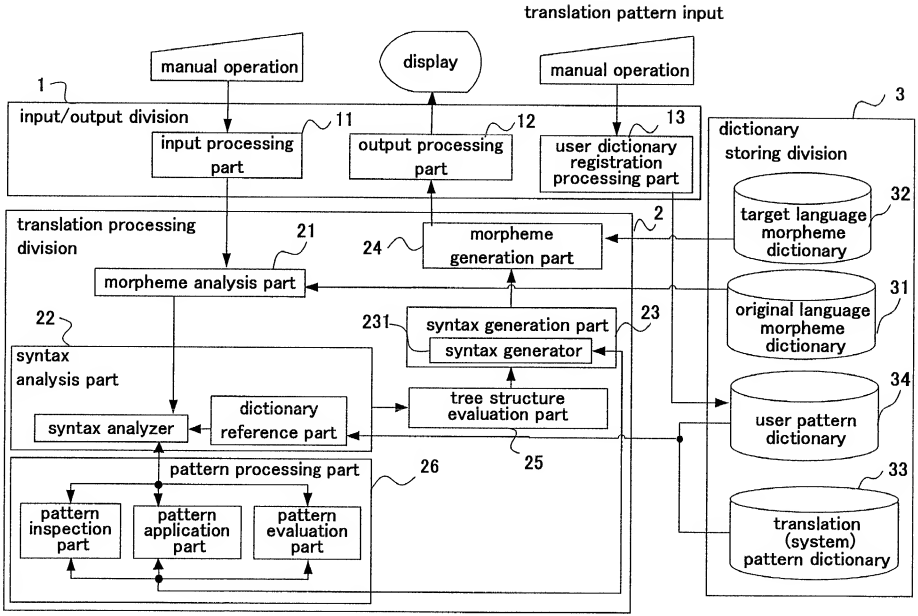
FIG.29



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Atty. Dkt.: 31759-173994
Filed: July 23, 2001

FIG.30

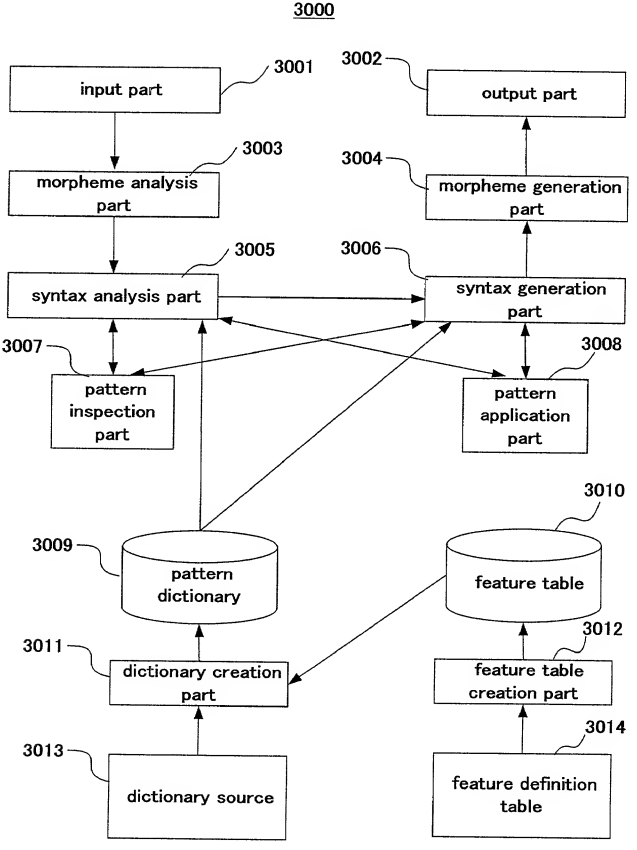
3000
input part
3001
output part
3002
morpheme analysis part
3003
morpheme generation part
3004
syntax analysis part
3005
syntax generation part
3006
pattern inspection part
3007
pattern application part
3008
pattern dictionary
3009
feature table
3010
dictionary creation part
3011
feature table creation part
3012
dictionary source
3013
feature definition table
3014

FIG.31

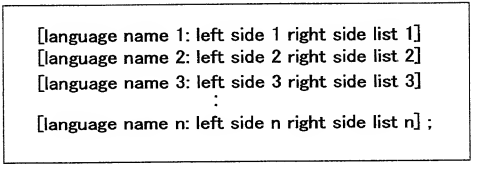

FIG.32

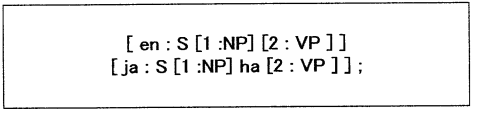

FIG.33

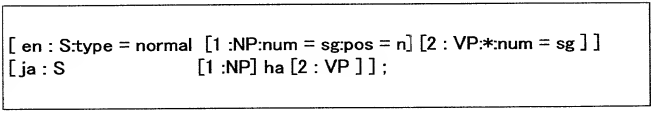

FIG.34

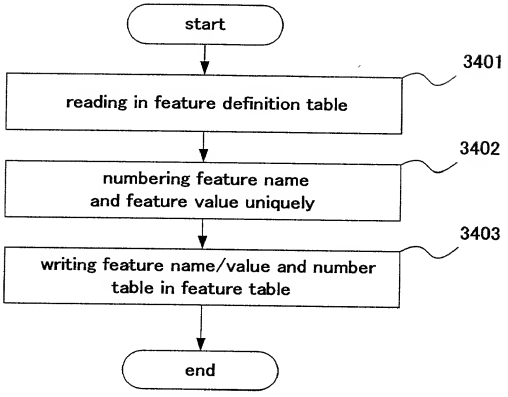

FIG.35

```
/* standard form */
string                baseForm ;
/* pos */
word                  pos = { n    adj   } ;
/* number */
word                  num = { sg   pl   } ;
```

FIG.36

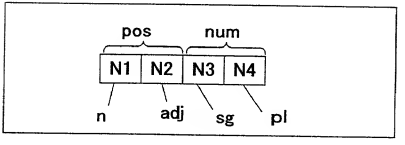

FIG.37

feature name = feature value
feature name ! = feature value
feature name = feature value 1 |feature value 2 |・・・|feature value x
feature name ! = feature value 1 |feature value 2 |・・・|feature value x

FIG.38

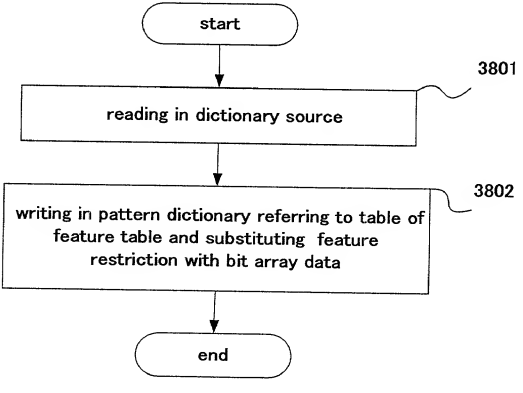

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FIG.39

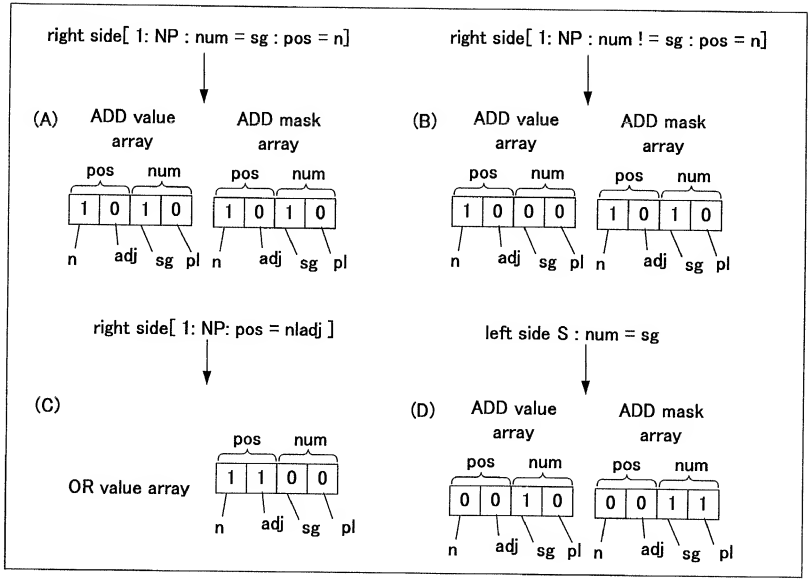

FIG.40

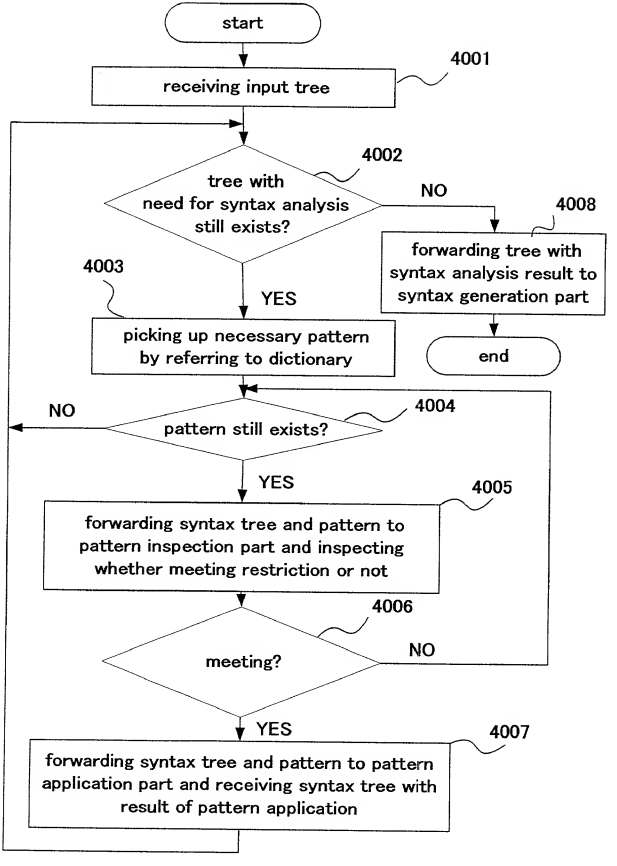

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FIG.41

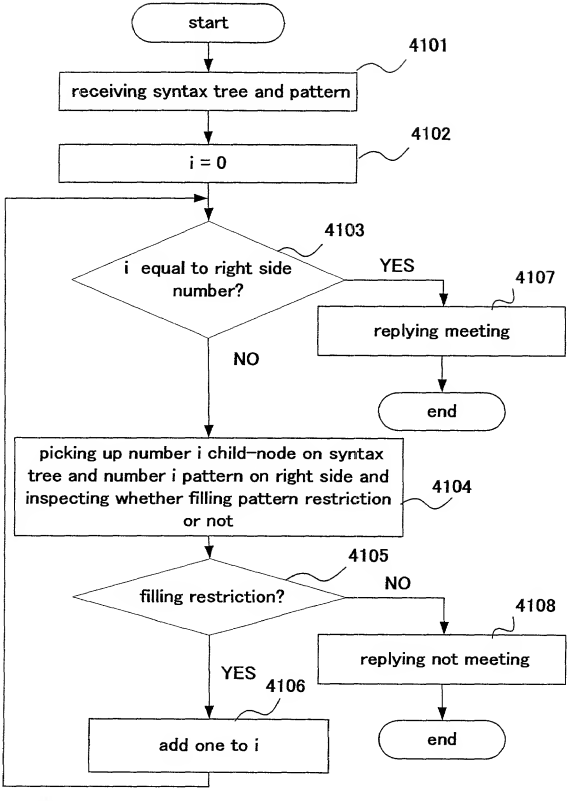
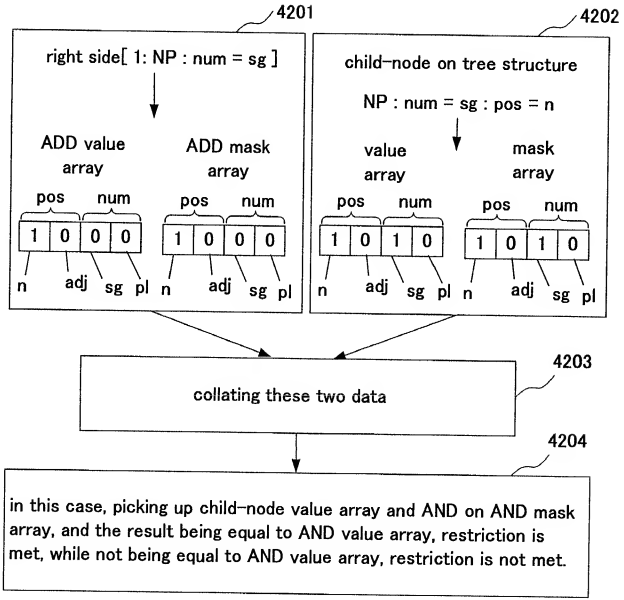

start
4101
receiving syntax tree and pattern
4102
i = 0
4103
i equal to right side number?
YES
4107
replying meeting
NO
end
picking up number i child-node on syntax tree and number i pattern on right side and inspecting whether filling pattern restriction or not
4104
4105
filling restriction?
NO
4108
replying not meeting
YES
4106
add one to i
end

FIG.42



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Atty. Dkt: 31759-17994
Filed: July 23, 2001

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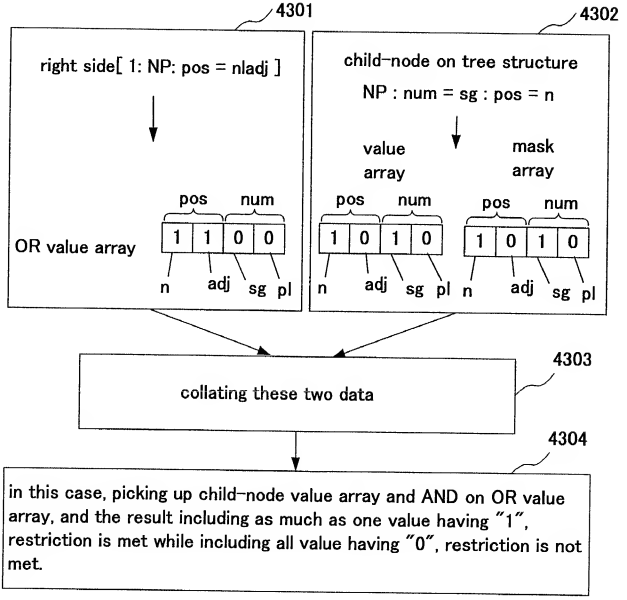
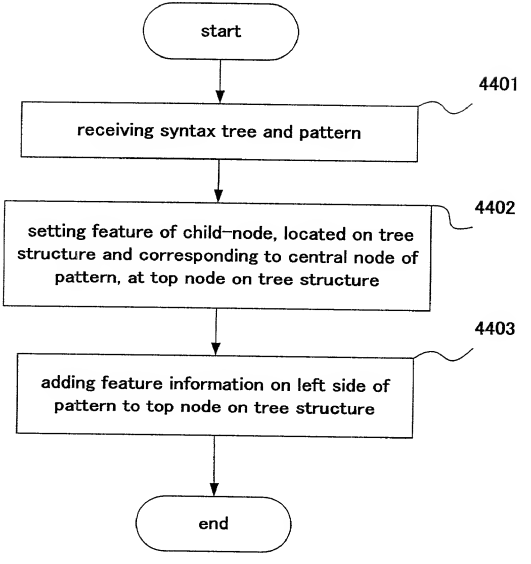
FIG.43



Inventors: MURATA et al
Atty. Dkt.: 31759-173994
Filed: July 23, 2001

FIG.44



10523 "10660660

FIG.45

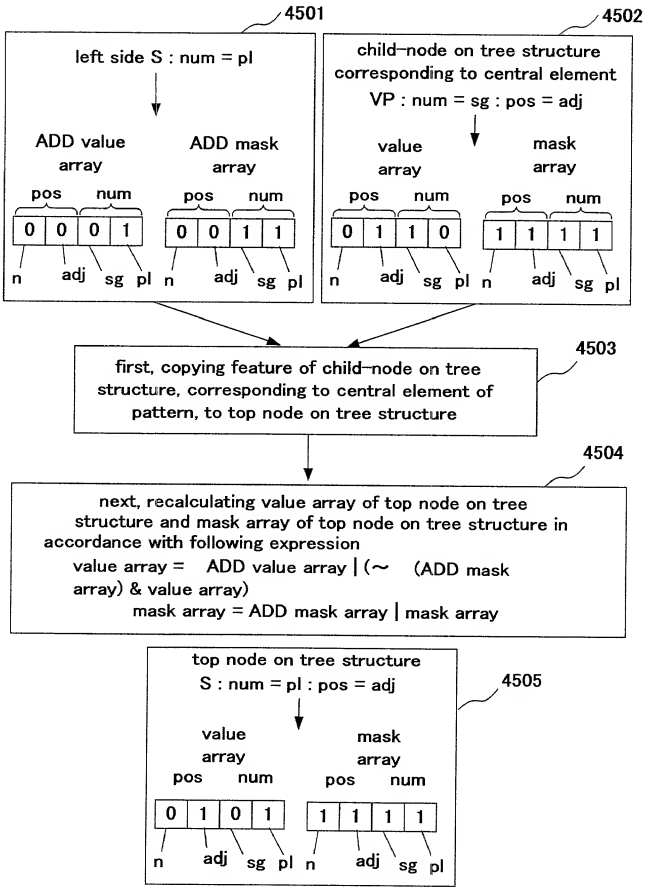

4501
left side S : num = pl
ADD value array
ADD mask array
pos num pos num
0 0 0 1
0 0 1 1
n adj sg pl n adj sg pl
4502
child-node on tree structure corresponding to central element
VP : num = sg : pos = adj
value array
mask array
pos num pos num
0 1 1 0
1 1 1 1
n adj sg pl n adj sg pl
4503
first, copying feature of child-node on tree structure, corresponding to central element of pattern, to top node on tree structure
4504
next, recalculating value array of top node on tree structure and mask array of top node on tree structure in accordance with following expression
value array = ADD value array | (~ (ADD mask array) & value array)
mask array = ADD mask array | mask array
top node on tree structure
S : num = pl : pos = adj
4505
value array
mask array
pos num pos num
0 1 0 1
1 1 1 1
n adj sg pl n adj sg pl

FIG.46

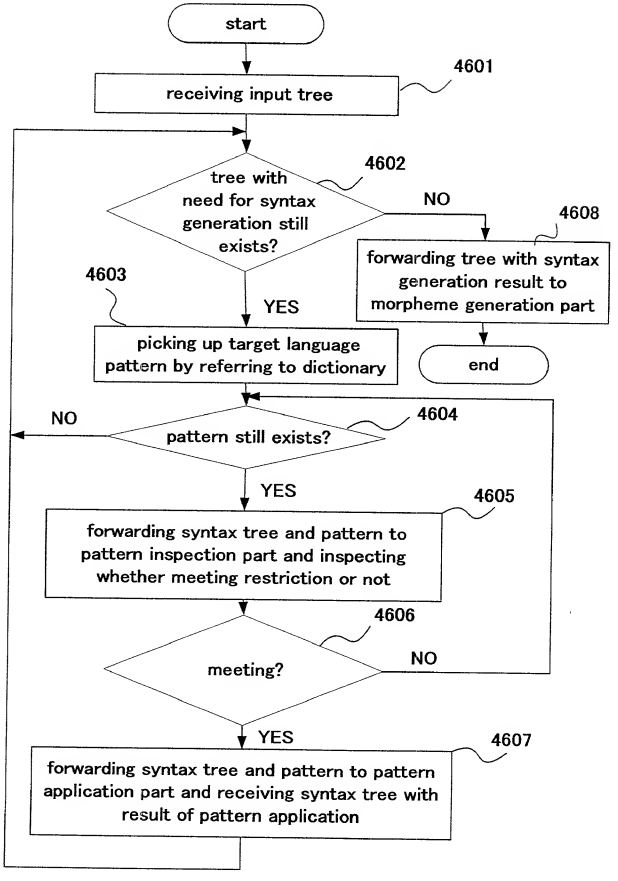

start
receiving input tree
4601
tree with need for syntax generation still exists?
4602
NO
4608
forwarding tree with syntax generation result to morpheme generation part
4603
YES
picking up target language pattern by referring to dictionary
end
NO
pattern still exists?
4604
YES
4605
forwarding syntax tree and pattern to pattern inspection part and inspecting whether meeting restriction or not
4606
meeting?
NO
YES
4607
forwarding syntax tree and pattern to pattern application part and receiving syntax tree with result of pattern application

FIG.47

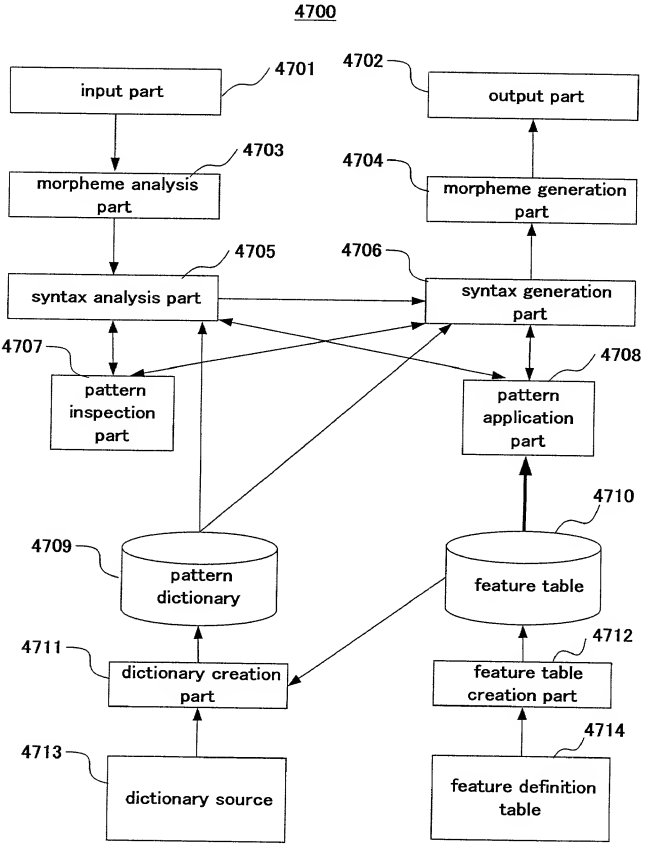

4700
4701
input part
4702
output part
4703
morpheme analysis part
4704
morpheme generation part
4705
syntax analysis part
4706
syntax generation part
4707
pattern inspection part
4708
pattern application part
4709
pattern dictionary
4710
feature table
4711
dictionary creation part
4712
feature table creation part
4713
dictionary source
4714
feature definition table

FIG.48

```
category    * = { baseForm surfaceForm  pos } ;
category    "" = { inf } ;
category    NP = { num sem } ;
category    VP = { num sem } ;
category    S = { num type } ;
```

FIG.49

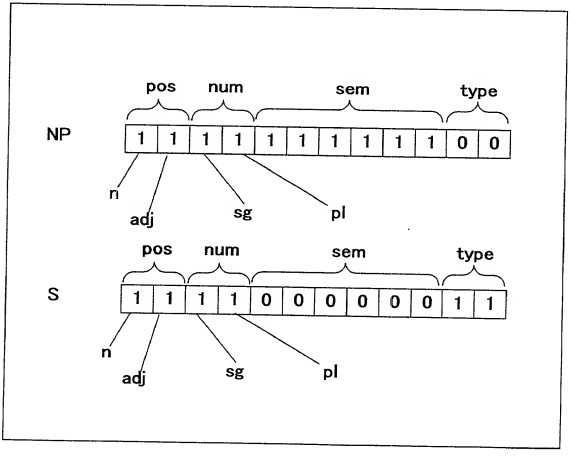


FIG.50

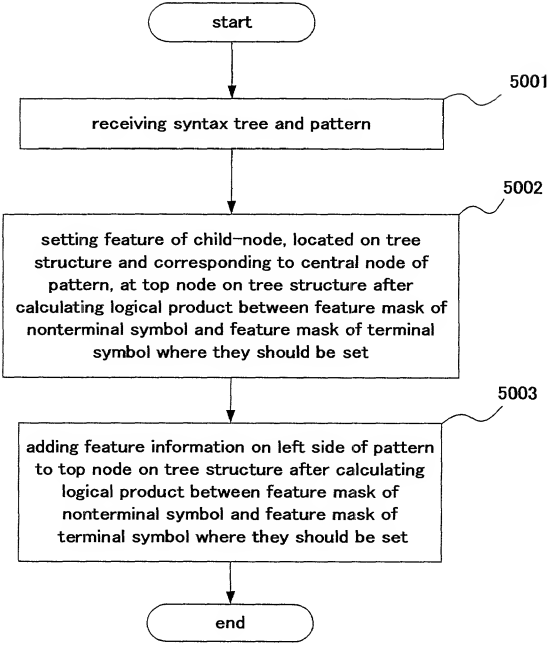

start
5001
receiving syntax tree and pattern
5002
setting feature of child-node, located on tree structure and corresponding to central node of pattern, at top node on tree structure after calculating logical product between feature mask of nonterminal symbol and feature mask of terminal symbol where they should be set
5003
adding feature information on left side of pattern to top node on tree structure after calculating logical product between feature mask of nonterminal symbol and feature mask of terminal symbol where they should be set
end

FIG.51

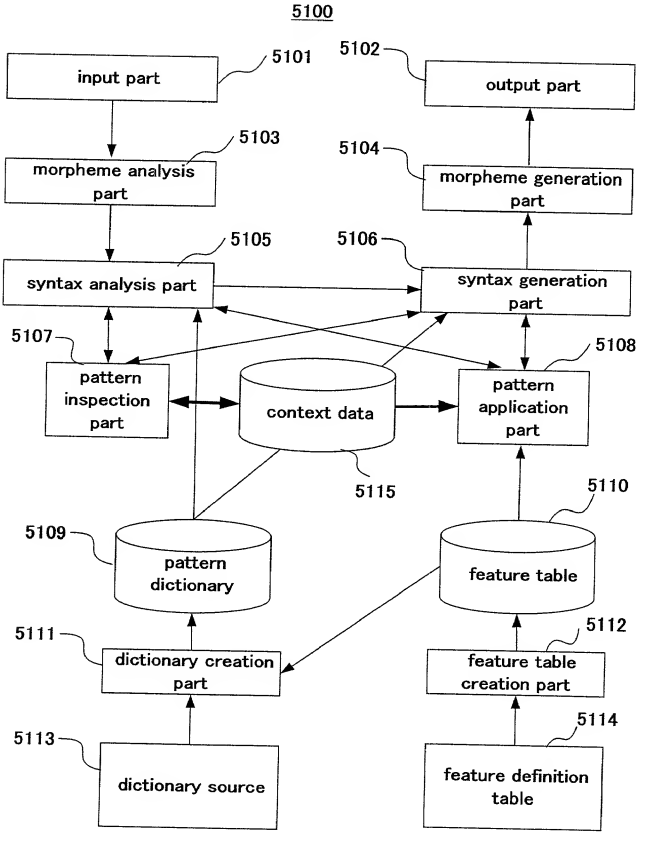

5100
input part
5101
output part
5102
morpheme analysis part
5103
morpheme generation part
5104
syntax analysis part
5105
syntax generation part
5106
pattern inspection part
5107
context data
pattern application part
5108
5115
pattern dictionary
5109
feature table
5110
dictionary creation part
5111
feature table creation part
5112
dictionary source
5113
feature definition table
5114

FIG.52

```
[ en :S:type = normal  [1 :NP:num = {NUM}:pos = n] [2 : VP:*:num = {NUM}]]
[ ja :S                [1 :P] ha [2 : VP ] ] ;
```

FIG.53

```
/* number  */
word num = sNum = oNum = {sg   pl } ;
```

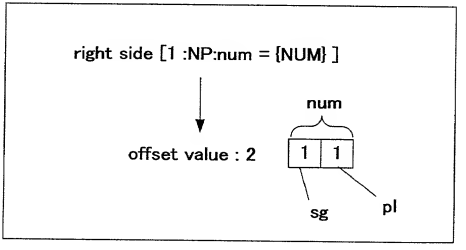



FIG.54